EVALUATION OF SYSTEMIC INDUCED RESISTANCE FOR SUPPRESSION OF XANTHOMONAS HORTORUM PV. CAROTAE IN CARROT SEED CROPS

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NEED: Hybrid carrot seed production in Jefferson County Oregon meets 80% of the domestic demand, and 65% of the global demand for this high-value crop. In carrot seed production, *Xanthomonas* (Xhc), a bacterial pathogen that causes 'bacterial blight', is a perplexing problem because the severity of bacterial blight symptoms observed on leaves and flowers of seed carrot is typically negligible, but the harvested seed frequently is infested with high populations of the pathogen. Conversely, in commercial carrot root crop production, seed planted with high populations of Xhc frequently develop bacterial blight, which causes yellowing and defoliation of leaves, reduces the plant's photosynthetic capacity, root size and sweetness. Methods to suppress Xhc in seed crops include sanitation (clean planting material and pre-bloom sprays of copper-based bactericides) and the use of drip irrigation to minimize wetting of the leaves and flowers. Drip irrigation has been adopted on 65-75% of the carrot seed acreage in Jefferson County. Nonetheless, these measures are only partially effective. Seed companies test carrot seed for Xhc in order to provide clean seed for carrot root crop production. Above a stated level of contamination, carrot seed is subjected to a hot water treatment to kill the pathogen. This is a reliable control for Xhc but the hot water treatment is expensive and has side effects of reduced seedling vigor and seed germination rate.

ACTION: This multi-state research, funded by a USDA-NIFA special grant, investigated efficacy of acibenzolar-S-methyl (ASM) applied as a soil treatment via drip irrigation to induce systemic acquired resistance to *Xanthomonas*. ASM has shown promise with citrus infected with a different strain of *Xanthomonas*. Research was conducted in greenhouse and large replicated field studies.

OUTCOMES: The project demonstrated that efficacy of ASM drench in carrot seed is highly dependent on timing in relation to infection events, and on dosage. Two or three applications of ASM at 4 oz per acre reduced Xhc populations detected on carrot seed by about 90-95%. Despite this, bacterial populations on seed were still above the threshold used to determine the need for hot water treatment. More research would be required to optimize ASM applications and integrate its use with other management practices.

Offshoots of this project included the sequencing of the Xhc genome, and the development of advanced molecular diagnostics that allow rapid detection and measurement of Xhc infestations in carrot seed. A workshop on the molecular detection of Xhc was held for 20 employees of international seed companies. Research results also have been shared with the Central Oregon Seed Growers and the Columbia Basin Vegetable Seed Associations.